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10/083,076	02/26/2002	David Chaohua Wu	13586US01	4707

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EXAMINER	
CHOW, CHARLES CHIANG	
ART UNIT	PAPER NUMBER
2685	2

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/083,076	Applicant(s) WU ET AL.	
	Examiner Charles Chow	Art Unit 2685	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 February 2002*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) ____ is/are withdrawn from consideration.

5)☐ Claim(s) ____ is/are allowed.

6)☒ Claim(s) *1-22* is/are rejected.

7)☐ Claim(s) ____ is/are objected to.

8)☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 February 2002* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. ____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date ____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. ____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: ____.

Detailed Action

Specification

1. In page 9 of the specification, the "=" sign is missed for equation 3, and equation 5.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-2, 8, 12, 15, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagai (US 4,486,897) in view of Wang (US 6,356,598 B1).

Regarding **claim 1**, Nagai teaches a system for demodulation of secondary audio program information (a system for demodulating sound signal S_{I2} centered at $5f_H$, 5 times horizontal deflection frequency of the composite signal Scmps, Fig. 1-3, abstract), the system comprising a bandpass filter (BPF 6) for isolating the secondary audio program information from a composite audio signal (the BPF 6 to separate third sound signal S_{I2} in Scmps, multiplexed sound broadcast signal, on terminal 1, col. 3, line 38 to col. 4, line 11), an FM demodulator (FM demodulator 12 for demodulating S_{I2},, secondary audio program SAP, utilizing isolating BPF 6, for selecting SI2 signal located at 5 times of the horizontal deflection frequency $5f_H$, Fig. 3, col. 4, lines 12-65). Nagai fails to teach the Hilbert filter for producing a copy of secondary audio program information with phase shift, for demodulating SAP using copy of SAP with phase shift and delayed copy of SAP to produce an FM demodulated signal. However, Wang teaches these features, the digital demodulator 22 (Fig.

3) for delaying the in-phase digitized signal from ADC 19 in delay module 322, the Hilbert filter 320 for shifting the digitized signal to a quadrature phase shifted signal, 90 degree, for demodulating by complex multiplier 324) in a HDTV receiver (Fig. 3, abstract, col. 3, line 45 to col. 4, line 24). Wang teaches an improved method for removing amplitude, phase distortion for a demodulator in HDTV receiver by utilizing a phase control loop for the NCO 348. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Nagai with Wand's quadrature phase shifting Hilbert filter 320, in phase signal delaying by delay 322 for demodulating broadcast signal, such that amplitude and phase distortion could be reduced.

Regarding **claim 2**, Wang teaches a delay module (322, Fig. 3) for delaying broadcast VSB audio of the HDTV program to produce the delayed copy of the sampled signal from delay 322 (col. 3, lines 66-67). Nagain teaches the SAP audio program demodulation for the language audio at $5f_H$.

Regarding **claim 8**, Wang teaches the Hilbert filter producing a copy of the audio program information with a 90 degree phase shift, the quadrature phase shifting of the sampled, copied, signal from Hilbert filter 320 (col. 3, lines 60-66). VSB audio of the HDTV Nagain teaches the SAP audio program demodulation for the language audio at $5f_H$.

Regarding **claim 12**, Nagai teaches a method for demodulation of a signal comprising isolating desired signal information from an audio signal (the audio S_{12} signal in composite signal Scmps, by utilizing bandpass filter, BPF 6, col. 3, line 38 to col. 4, line 11), an FM demodulator (FM demodulator 12 for demodulating S_{12},, secondary audio program SAP, utilizing isolating BPF 6, for selecting SI2 signal located at 5 times of the horizontal

deflection frequency $5f_H$, Fig. 3, col. 4, lines 12-65). Nagai fails to teach the phase shifting copy of the desired signal information to produce a phase shifted copy of the desired information, and delaying a copy of the desired signal information to produce a delayed copy of desired signal information. However, Wang teaches these features, the digital demodulator 22 (Fig. 3) for delaying the in-phase digitized signal from ADC 19 in delay module 322, the Hiltert filter 320 for shifting the digitized signal to a quadrature phase shifted signal, 90 degree, for demodulating by complex multiplier 324) in a HDTV receiver (Fig. 3, abstract, col. 3, line 45 to col. 4, line 24). Wang teaches an improved method for removing amplitude, phase distortion for a demodulator in HDTV receiver by utilizing a phase control loop for the NCO 348. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Nagai with Wand's quadrature phase shifting Hilbert filter 320, in phase signal delaying by delay 322 for demodulating broadcast signal, such that amplitude and phase distortion could be reduced.

Regarding **claim 15**, Wang teaches the Hilbert filter producing a copy of the audio program information with a 90 degree phase shift, the quadrature phase shifting of the sampled, copied, signal from Hilbert filter 320 (col. 3, lines 60-66). VSB audio of the HDTV Nagain teaches the SAP audio program demodulation for the language audio at $5f_H$.

Regarding **claim 19**, Nagai teaches a method for audio program signal demodulation using a bandpass filter, BPF 6 with a simple, minimal number of, coefficient to isolate the audio signal to isolate S_{12} in composite signal Scmps, for demodulating sound signal S_{12} centered at $5f_H$, 5 times horizontal deflection frequency of the composite signal Scmps, by utilizing FM demodulator, Fig. 1-3, abstract), Nagai fails to teach the using a Hilbert filter

with minimal number of coefficients to produce a signal in phase quadrature, the using a simple approximation for FM demodulation and signal in quadrature phase. However, Wang teaches these features, the digital demodulator 22 (Fig. 3) having simple approximation for demodulation by utilizing multiplier 324 to multiplying delayed digital signal and quadrature phase shifted signal with the Sin, Cos signal from NCO 348 (col. 4, lines 37-50), the ADC 19 coupled to a delay module 322, a Hiltert filter 320 for providing phase shift of the digitized signal to a quadrature, 90 degree, phase shifted signal with minimum number of coefficient as needed to shift the phase to quadrature, 90 degree, phase position, for demodulating by complex multiplier 324 in a HDTV receiver (Fig. 3, abstract, col. 3, line 45 to col. 4, line 24). Wang teaches an improved method for removing amplitude, phase distortion for a demodulator in HDTV receiver by utilizing a phase control loop for the NCO 348. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Nagai with Wand's quadrature phase shifting Hilbert filter 320, in phase signal delaying by delay 322 for demodulating broadcast signal, such that amplitude and phase distortion could be reduced.

3. Claims 4, 9-10, 14, 16-17, 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagai in view of Wang, and further in view of Kammeyer (US 4,506,228).

Regarding **claim 4**, Nagai and Wang fail to teach the lowpass filter for eliminating noise from the FM demodulated signal. However, Kammeyer teaches the low pass filter 150 coupled to demodulator (Fig. 14) for reducing or limiting noise with gently rising characteristic that falls off above the limit frequency at the upper frequency limit (col. 13,

line 63 to col. 14 line 7), the cross products of the delayed and undelayed Hilbert transforms and the difference between them for the FM demodulation, the delay 60, the multiplier 62, Hilbert transform 57 followed by filter 59, multiplier 63, subtractor 64 (abstract, Fig. 1-8, col. 3, line 49 to col. 6, line 63). Kammeyer teaches an improved digital FM demodulator with frequency accuracy, signal quality and low cost (col. 1, lines 15-57). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Nagai, Wang, with Kammeyer's low pass filter at the output of the demodulator, such that the noise could be reduced by utilizing the output low pass filter, for quality, low cost FM demodulator.

Regarding **claim 9,** Kammeyer teaches FM demodulator uses a simplified approximation for simplified demodulation of the audio signal, the simplified approximation $\frac{1}{4} * \Delta\Omega\ T * V(k^T)$ for the FM demodulation, the $\Delta\Omega$ is f_{dev} frequency deviation in applicant's specification (col. 6, lines 32-63), the $\Delta\Omega\ T$ is equivalent to applicant's $2\pi f_{dev.}$ Nagai teaches the SAP audio.

Regarding **claim 10**, Kammeyer teaches FM demodulator produces the FM demodulated signal using I(n) * Q(n-d) –Q(n) * I(n-d) wherein I(n) represent delayed copy, Q(n) represent phase shifted copy, d represent a non-unity delay and n represent a discrete time index, the digital demodulator (Fig. 1) to demodulate FM signal by cross products of the delayed and undelayed Hilbert transforms and the difference between them for the FM demodulation, the delay 60, the multiplier 62, Hilbert transform 57 followed by filter 59, multiplier 63, subtractor 64 (abstract, Fig. 1-8, col. 3, line 49 to col. 6, line 63; col. 17, line 61 to col. 18, line 40).

Regarding **claim 14**, Kammeyer teaches eliminating noixe from the FM demodulated signal,

the low pass filter 150 coupled to demodulator (Fig. 4) for reducing or limiting noise with gently rising characteristic that falls off above the limit frequency at the upper frequency limit (col. 13, line 63 to col. 14 line 7),

Regarding **claim 16,** Kammeyer teaches FM demodulator uses a simplified approximation for simplified demodulation of the audio signal, the simplified approximation ¼ * ΔΩ T * $V(k^T)$ for the FM demodulation, the ΔΩ is f_{dev} (col. 6, lines 32-63), the ΔΩ T is equivalent to applicant's $2\pi f_{dev.}$ Nagai teaches the SAP audio.

Regarding **claim 17,** Kammeyer teaches FM demodulator produces the FM demodulated signal using I(n) * Q(n-d) –Q(n) * I(n-d) wherein I(n) represent delayed copy, Q(n) represent phase shifted copy, d represent a non-unity delay and n represent a discrete time index, the digital demodulator (Fig. 1) to demodulate FM signal by <u>cross products of the delayed and undelayed Hilbert transforms and the difference between them for the FM demodulation</u>, the delay 60, the multiplier 62, Hilbert transform 57 followed by filter 59, multiplier 63, subtractor 64 (abstract, Fig. 1-8, col. 3, line 49 to col. 6, line 63; col. 17, line 61 to col. 18, line 40).

Regarding **claim 21**, Kammeyer teaches the low pass filter with a minimual number of coefficient (the gently rising characteristic that falls off at upper frequency), the low pass filter 150 coupled to demodulator (Fig. 14) for reducing or limiting noise with gently rising characteristic that falls off above the limit frequency at the upper frequency limit (col. 13, line 63 to col. 14 line 7).

Regarding **claim 22**, Kammeyer teaches FM demodulator produces the FM demodulated signal using I(n) * Q(n-d) –Q(n) * I(n-d) wherein I(n) represent delayed copy, Q(n) represent

phase shifted copy, d represent a non-unity delay and n represent a discrete time index, the digital demodulator (Fig. 1) to demodulate FM signal by cross products of the delayed and undelayed Hilbert transforms and the difference between them for the FM demodulation, the delay 60, the multiplier 62, Hilbert transform 57 followed by filter 59, multiplier 63, subtractor 64 (abstract, Fig. 1-8, col. 3, line 49 to col. 6, line 63; col. 17, line 61 to col. 18, line 40).

4. Claims 3, 5-7, 11, 13, 18, 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nagai in view of Wang, and further in view of Collier et al. (US 5,404,405).

Regarding **claim 3**, Wang mentioned AGC circuit in col. 2, lines 3-4, col. 6, lines 24-26. Nagai and Wang fail to teach an automatic gain control for normalizing amplitude of an FM carrier signal at the FM demodulator. However, Collier et al. (Collier) teaches these features, the divider 30 for normalizing the amplitude of the audio sub-carrier, I2-Q2 by I2+Q2, the dividing of the sub-carrier power by the pilot signal power (col. 4, lines 27-38). Collier teaches the FM demodulator having delayed copy and phase shifted copy from Hilter filter 18, for demodulating audio signal on the sub-carrier 38 KHz, using digital signal processing DSP (abstract, col. 1, line 62 to col. 2, line 45, col. 1, lines 8-10), to reducing the signal distortion (col. 1, lines 42-66). Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to modify Nagai, Wang, with Collier's normalized sub-carrier extraction for FM demodulation, such that the signal distortion could be improved.

Regarding **claim 5,** Collier teaches the bandpass filter comprises a finite impulse response filter FIR, the digital filter 8 is a FIR filter (Fig. 1, col. 2, lines 58-67) for processing FM signal.

Regarding **claim 6**, Collier teaches the bandpass filter comprises a 32-tap FIR filter, the bandpass filter 8 is cascaded with M section taps (col. 2, lines 63-64), the number of individual FIR filter, taps, is a matter of design choice for enabling the signal demodulation (col. 3, line 37-45).

Regarding **claim 7**, Collier teaches the Hilbert filter comprises an 11 tap Hilbert filter, the Hilbert filter 18 having sample length N, taps, and N can be selected for tradeoff between performance and cost. N can be on the order of 15.

Regarding **claim 11,** Collier teaches the delay, d, is 2, the delay 20 is set according to (N-1)/2, and N has to be of minimum value for (N-1)/2. If N is equal to 1, then, (N-1)/2 is zero (col. 4, lines 1-13).

Regarding **claim 13,** Collier teaches the normalizing amplitude of an FM carrier at the FM demodulator, the divider 30 for normalizing the amplitude of the audio sub-carrier, I2-Q2 by I2+Q2, the dividing of the sub-carrier power by the pilot signal power (col. 4, lines 27-38).

Regarding **claim 18**, Collier teaches the delay, d, is 2, the delay 20 is set according to (N-1)/2, and N has to be of minimum value for (N-1)/2. If N is equal to 1, then, (N-1)/2 is zero (col. 4, lines 1-13).

Regarding **claim 20**, Wang mentioned AGC circuit in col. 2, lines 3-4, col. 6, lines 24-26. Nagai and Wang fail to teach an automatic gain control for normalizing amplitude of an FM carrier signal at the FM demodulator. However, Collier et al. (Collier) teaches these features,

the divider 30 for normalizing the amplitude of the audio sub-carrier, I2-Q2 by I2+Q2, the dividing of the sub-carrier power by the pilot signal power (col. 4, lines 27-38).

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

   A. US 4,628,539, December 1986, Selwa teaches the muting of the SAP signal after detecting the SAP is present (abstract and figure).

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Charles Chow whose telephone number is (703)-306-5615. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Urban, can be reached at (703)-305-4385.

   Any response to this action should be mailed to:

   Commissioner of Patents and Trademarks

   Washington, D.C. 20231

   or faxed to: (703) 872-9306 (for Technology Center 2600 only)

   Hand-delivered responses should be brought to 220 South 20th Street, Crystal Plaza Two, Lobby, Room 1B03, Arlington, VA 22202 (Customer Window).

   Any inquiry of a general nature or relating to the status of this application or whose telephone number is (703) 306-0377.

Charles Chow C.C.

October 22, 2004.

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TECHNOLOGY CENTER 2600